

CLAIMS

1 1. A computer-implemented method to support in developing a process
2 specification for a collaborative process involving distributed computer-based
3 participant systems exchanging messages through an asynchronous messaging
4 network, the method embodied by a computer program product executable by a
5 computer system and causing, when executed, said computer system to carry out
6 the steps of:

7 retrieving from a first storage location, sub-system state information on sub-
8 system states and sub-system state transitions in relation to a plurality of software
9 sub-systems of each participant system, said sub-system state information
10 specifying in relation to each sub-system state transition, starting and target sub-
11 system states of the corresponding software sub-system and events triggering,
12 and resulting from, the respective sub-system state transition;

13 processing said retrieved sub-system state information to generate, and
14 store in a second storage location, collaboration state information on collaboration
15 states and collaboration state transitions of said process, said collaboration states
16 being defined by a sub-system state for each software sub-system of each
17 participant system and a communication status of each message exchangeable
18 between said participant systems, said collaboration state transitions being
19 determined based on said sub-system state transitions;

20 upon generation and storage of said collaboration state information,
21 retrieving said collaboration state information from said second storage location;

22 processing said retrieved collaboration state information to generate
23 information on incompletely specified terminal collaboration states among said
24 collaboration states, an incompletely specified terminal collaboration state being a
25 terminal collaboration state in which at least one message is underway between
26 said participant systems; and

27 generating a result data object containing information on every incompletely
28 specified terminal collaboration state found.

1 2. The method of claim 1, wherein said step of processing said sub-system
2 state information includes the steps of:
3 processing said sub-system state information to generate, and store in a
4 third storage location, local state information on local states and local state
5 transitions of each participant system, said local state information specifying in
6 relation to each local state transition, starting and target local states of the
7 corresponding participant system and events triggering, and resulting from, the
8 respective local state transition, said local states being defined by a sub-system
9 state for each software sub-system of the respective participant system, said local
10 state transitions being defined by applying said sub-system state transitions to said
11 local states;
12 upon generation and storage of said local state information, retrieving said
13 local state information from said third storage location; and
14 processing said retrieved local state information to generate said
15 collaboration state information, said collaboration state transitions being
16 determined by applying said local state transitions to said collaboration states.

1 3. The method of claim 2, wherein said step of processing said sub-system
2 state information includes the steps of:
3 identifying an initial sub-system state from said sub-system states of each
4 software sub-system; and
5 generating said local state information by determining an initial local state
6 for each participant system from said initial sub-system states of said software
7 sub-system of the respective participant system, determining subsequent local
8 states by applying said sub-system state transitions to said initial local states, and
9 reiterating applying said sub-system state transitions to local states identified in a
10 previous iteration until no further local states are found.

1 4. The method of claim 2 or 3, wherein said step of processing said retrieved
2 local state information includes generating, and storing in said second storage
3 location, information on a set of virtual global states, said virtual global states
4 being defined each by a local state for each participant system and a

5 communication status of each message, said set of virtual global states comprising
6 states of any combination of local states of said participant systems and
7 communication statuses of said messages.

1 5. The method of claim 4, wherein said virtual global states are represented
2 each by a global state vector composed of first global state vector elements
3 indicating a local state for each participant system and one or more second global
4 state vector elements, one in relation to each message, each second global state
5 vector element indicating a communication status of the respective message, said
6 set of virtual global states comprising states of any combination of values of said
7 first and second global state vector elements.

1 6. The method of claim 4 or 5, wherein said step of processing said retrieved
2 local state information includes identifying an initial global state among said virtual
3 global states, said initial global state being one in which at least one local state
4 transition as specified by said local state information and involving a local trigger is
5 applicable to said initial global state and no message is underway between said
6 participant systems, said local state transition causing a global state transition from
7 said initial global state to another virtual global state; determining every virtual
8 global state reachable when starting from said initial global state; and determining
9 said initial global state and every virtual global state reachable from said initial
10 global state to be collaboration states.

1 7. The method of claim 3, wherein said step of processing said local state
2 information includes the step of generating said collaboration state information by:
3 determining an initial collaboration state, said initial collaboration state being
4 defined by an initial local state for each participant system and a non-presence
5 communication status of each message;
6 determining subsequent collaboration states by applying said local state
7 transitions to said initial collaboration state; and
8 reiterating applying said local state transitions to collaboration states
9 identified in a previous iteration until no further collaboration states are found.

1 8. A computer-implemented method to support in developing a process
2 specification for a collaborative process involving distributed computer-based
3 participant systems exchanging messages through an asynchronous messaging
4 network, the method embodied by a computer program product executable by a
5 computer system and causing, when executed, said computer system to carry out
6 the steps of:

7 retrieving from a third storage location, local state information on local
8 states and local state transitions in relation to each participant system, said local
9 state information specifying in relation to each local state transition, starting and
10 target local states of the corresponding participant system and events triggering,
11 and resulting from, the respective local state transition;

12 processing said retrieved local state information to generate, and store in a
13 second storage location, information on collaboration states and collaboration
14 state transitions of said process, said collaboration states defined by a local state
15 for each participant system and a communication status of each message
16 exchangeable between said participant systems, said step of processing said local
17 state information including the steps of identifying an initial local state from said
18 local states of each participant system and generating said collaboration state
19 information by:

20 determining an initial collaboration state, said initial collaboration
21 state being defined by said initial local state of each participant system and
22 a non-presence communication status of each message;

23 determining subsequent collaboration states by applying said local
24 state transitions to said initial collaboration state; and

25 reiterating applying said local state transitions to collaboration states
26 identified in a previous iteration until no further collaboration states are
27 found;

28 upon generation and storage of said collaboration state information,
29 retrieving said collaboration state information from said second storage location;

30 processing said retrieved collaboration state information to generate
31 information on incompletely specified terminal collaboration states among said

32 collaboration states, an incompletely specified terminal collaboration state being a
33 terminal collaboration state in which at least one message is underway between
34 said participant systems; and

35 generating a result data object containing information on every incompletely
36 specified terminal collaboration state found.

1 9. The method of any of claims 1 to 8, further comprising the step of storing
2 said result data object in a fourth storage location.

1 10. The method of any of claims 1 to 9, further comprising the step of providing
2 said result data object to a graphical output device to visually present on a display
3 a presentation object indicating every incompletely specified terminal collaboration
4 state found.

1 11. The method of any of claims 1 to 10, wherein said communication status is
2 a binary status indicating whether or not the respective message is underway
3 between said participant systems.

1 12. A computer system to support in developing a process specification for a
2 collaborative process involving distributed computer-based participant systems
3 exchanging messages through an asynchronous messaging network, said
4 computer system provided with a computer program product that, when executed,
5 causes said computer system to carry out the steps of:

6 retrieving from a first storage location, sub-system state information on sub-
7 system states and sub-system state transitions in relation to a plurality of software
8 sub-systems of each participant system, said sub-system state information
9 specifying in relation to each sub-system state transition, starting and target sub-
10 system states of the corresponding software sub-system and events triggering,
11 and resulting from, the respective sub-system state transition;

12 processing said retrieved sub-system state information to generate, and
13 store in a second storage location, collaboration state information on collaboration
14 states and collaboration state transitions of said process, said collaboration states
15 being defined by a sub-system state for each software sub-system of each

participant system and a communication status of each message exchangeable between said participant systems, said collaboration state transitions being determined based on said sub-system state transitions;

upon generation and storage of said collaboration state information, retrieving said collaboration state information from said second storage location; processing said retrieved collaboration state information to generate information on incompletely specified terminal collaboration states among said collaboration states, an incompletely specified terminal collaboration state being a terminal collaboration state in which at least one message is underway between said participant systems; and generating a result data object containing information on every incompletely specified terminal collaboration state found.

13. A computer system to support in developing a process specification for a collaborative process involving distributed computer-based participant systems exchanging messages through an asynchronous messaging network, said computer system provided with a computer program product that, when executed, causes said computer system to carry out the steps of:

retrieving from a third storage location, local state information on local states and local state transitions in relation to each participant system, said local state information specifying in relation to each local state transition, starting and target local states of the corresponding participant system and events triggering, and resulting from, the respective local state transition;

processing said retrieved local state information to generate, and store in a second storage location, information on collaboration states and collaboration state transitions of said process, said collaboration states defined by a local state for each participant system and a communication status of each message exchangeable between said participant systems, said step of processing said local state information including the steps of identifying an initial local state from said local states of each participant system and generating said collaboration state information by:

19 determining an initial collaboration state, said initial collaboration
20 state being defined by said initial local state of each participant system and
21 a non-presence communication status of each message;
22 determining subsequent collaboration states by applying said local
23 state transitions to said initial collaboration state; and
24 reiterating applying said local state transitions to collaboration states
25 identified in a previous iteration until no further collaboration states are
26 found;
27 upon generation and storage of said collaboration state information,
28 retrieving said collaboration state information from said second storage location;
29 processing said retrieved collaboration state information to generate
30 information on incompletely specified terminal collaboration states among said
31 collaboration states, an incompletely specified terminal collaboration state being a
32 terminal collaboration state in which at least one message is underway between
33 said participant systems; and
34 generating a result data object containing information on every incompletely
35 specified terminal collaboration state found.